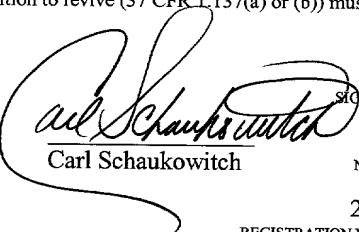




JB18 Rec'd PCT/PTO 05 APR 2002

| | | |
|--|--|--|
| TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371 | | ATTORNEY'S DOCKET NUMBER SPO-0210 |
| INTERNATIONAL APPLICATION NO. PCT/JP00/06178 | | U.S. APPLICATION NO. (if known, see 37 C.F.R. 1.5) 10/089937 |
| INTERNATIONAL FILING DATE September 8, 2000 | | PRIORITY DATE CLAIMED October 13, 1999 |
| TITLE OF INVENTION: COMMUNICATION DEVICE | | |
| APPLICANT(S) FOR DO/EO/US (1) Katsutoshi NAGI; and (2) Takashi UEDA | | |
| Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information: | | |
| <p>1. <input checked="" type="checkbox"/> This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.</p> <p>2. <input type="checkbox"/> This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.</p> <p>3. <input checked="" type="checkbox"/> This express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(I)).</p> <p>4. <input checked="" type="checkbox"/> A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.</p> <p>5. <input checked="" type="checkbox"/> A copy of the International Application as filed (35 U.S.C. 371(c)(2)) a. <input checked="" type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> has been transmitted by the International Bureau c. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US).</p> <p>6. <input checked="" type="checkbox"/> A translation of the International Application into English (35 U.S.C. 371(c)(2)).</p> <p>7. <input checked="" type="checkbox"/> Amendment to the claims of the International Application under PCT Article 34. a. <input checked="" type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). b. <input type="checkbox"/> have been transmitted by the International Bureau. c. <input type="checkbox"/> have not been made; however, the time limit for making such amendment has NOT expired. d. <input type="checkbox"/> have not been made and will not be made.</p> <p>8. <input checked="" type="checkbox"/> A translation of the amendments to the claims under PCT Article 34.</p> <p>9. <input checked="" type="checkbox"/> An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).</p> <p>10. <input type="checkbox"/> A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).</p> | | |
| Items 11 to 16 below concern either document(s) or information included: | | |
| 11. <input checked="" type="checkbox"/> An Information Disclosure Statement under 37 CFR 1.97 and 1.98. <p>12. <input checked="" type="checkbox"/> An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.</p> <p>13. <input type="checkbox"/> A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.</p> <p>14. <input type="checkbox"/> A substitute specification.</p> <p>15. <input type="checkbox"/> A change of power of attorney and/or address letter.</p> <p>16. <input checked="" type="checkbox"/> Other items: Publication of WO 01/27869 issued on April 19, 2001.</p> | | |

JC13 Rec'd PCT/PTO 05 APR 2002

| | | | | | |
|--|--------------|--|--------------------------------------|--------------|---|
| U.S. APPLICATION NO. (if known, 37 CFR 1.57) | | INTERNATIONAL APPLICATION NO PCT/JP00/06178 | ATTORNEY'S DOCKET NUMBER SPO-0210 | | |
| 101089937 | | | CALCULATIONS | PTO USE ONLY | |
| 17. <input checked="" type="checkbox"/> The following fees are submitted: | | | | | |
| Basic National Fee (37 CFR 1.49(a)(1)-(5): Search Report has been prepared by the EPO or JPO..... | | \$ 890.00 | | | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) | | | | | |
| No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))..... | | | | | |
| Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... | | | | | |
| International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... | | | | | |
| ENTER APPROPRIATE BASIC FEE AMOUNT = | | \$ 890.00 | | | |
| Surcharge of \$130.00 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.49(e)). | | \$ 130.00 | | | |
| Claims | Number Filed | Number Extra | Rate | | |
| Total | 15-20= | 0 | \$ 0.00 | | |
| Independent | 2-3= | 0 | \$ 0.00 | | |
| Multiple dependent claim(s) (if applicable) | | + \$280 | \$ 0.00 | | |
| TOTAL OF ABOVE CALCULATIONS | | | = \$ 1,020.00 | | |
| Reduction by ½ for filing by small entity, if applicable. | | | | | |
| SUBTOTAL | | | = - | | |
| Processing fee of \$130.00 for furnishing the English translation later than <input type="checkbox"/> 20 <input checked="" type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.49(f)). | | | + \$ 130.00 | | |
| TOTAL NATIONAL FEE | | | = \$ 1,150.00 | | |
| Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate sheet (37 CFR 3.28, 3.31). \$40.00 per property | | | + \$ 0.00 | | |
| TOTAL FEES ENCLOSED | | | = \$ 1,150.00 | | |
| | | | Amount to be refunded. | \$ | |
| | | | charged. | \$ | |
| a. <input type="checkbox"/> A check in the amount of \$_____ to cover the above fees is enclosed. | | | | | |
| b. <input checked="" type="checkbox"/> Please charge my Deposit Account No. <u>18-0013</u> in the amount of \$ 1,150.00 covers the above fees. A duplicate of this sheet is enclosed. | | | | | |
| c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>18-0013</u> . A duplicate copy of this sheet is enclosed. | | | | | |
| NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status. | | | | | |
| SEND ALL CORRESPONDENCE TO: | | | | | |
| Rader, Fishman & Grauer, L.P.P.C. 1233 20 th Street, N.W., Suite 501 Washington, DC 20036 703-955-8711 | | | | | |
| Dated: April 5, 2002 | | | | | |
| | | | | |  SIGNATURE Carl Schaukowitch NAME707 |
| | | | | | 29,211 REGISTRATION NUMBER |

SPECIFICATION**COMMUNICATION DEVICE****5 Technical field**

The present invention relates to a communication device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis.

10 Background art

A non-contact communication system consists of an interrogator installed in a fixed position and a responder formed in the shape of a card so as to be portable. The supply of electric power from the interrogator to the responder and the communication between the interrogator and the responder are achieved by electromagnetic induction on a non-contact basis. Thus, non-contact communication systems, having the advantages that the responder does not need to incorporate a battery and that the interrogator and the responder communicate with each other on a non-contact basis, are adopted in a variety of fields, for example in lift facilities in skiing grounds, for ticket examination in railway systems, and for baggage sorting.

Now, an interrogator 1 and a responder 2 constituting a non-contact communication system will be described with reference to Fig. 7. The interrogator 1 operates as follows. A modulator circuit 12 modulates a carrier, which is a radio-frequency signal output from a carrier supply circuit 11, with an interrogation

signal Q, which is fed from a controller 16, and outputs a modulated signal. The signal output from the modulator circuit 12 is subjected to power amplification by a power amplifier circuit 13, and is then transmitted from an antenna 14 composed of a coil 141 and a capacitor 142.

5 The controller 16 is so configured as to keep feeding the interrogation signal Q to the modulator circuit 12 for a predetermined period, then cease feeding it thereto for a predetermined period, and then repeat these two modes of operation alternately. Thus, as shown in Fig. 8(a), the signal transmitted from the interrogator 1 is a radio-frequency signal that is modulated with the interrogation signal Q in periods T1 and that is unmodulated in periods T2, with the periods T1 and T2 repeating alternately.
10

The responder 2 operates as follows. Through electromagnetic induction, the signal transmitted from the interrogator 1 is received by an antenna 21 composed of a coil 211 and a capacitor 212. The signal received by the antenna 21
15 is rectified by a rectifier circuit 22, and a regulator 25 produces, from the resulting direct-current electric power, stabilized direct-current electric power. A demodulator circuit 26 and a signal processor circuit 27 operate from the electric power produced by the regulator 25.

The demodulator circuit 26 demodulates the interrogation signal Q from the
20 signal obtained from the rectifier circuit 22 in the periods T1. The signal processor circuit 27 outputs, in the periods T2, a response signal A corresponding to the interrogation signal Q demodulated by the demodulator circuit 26. This response signal A consists of a train of pulses, and controls the on/off states of a switch circuit 24. The switch circuit 24 is connected in series with a resistor 23,

and these are connected across the output of the rectifier circuit 22. Thus, as the switch circuit 24 is turned on and off, the impedance of the load circuit that is connected to the output of the power amplifier circuit 13 of the interrogator 1 and that thus includes the responder 2 varies. The resistor 23 and the switch circuit

5 24 may be connected across the input of the rectifier circuit 22.

Accordingly, in the periods T2, the signal output from the power amplifier circuit 13, which is originally an unmodulated carrier, is amplitude-modulated by the response signal A as shown in Fig. 8(b) as a result of the variation in the impedance of the load circuit of the power amplifier circuit 13. This modulated 10 signal is demodulated by a demodulator circuit 15 of the interrogator 1, and thus the response signal A is obtained. According to the response signal A obtained from the demodulator circuit 15, the controller 16 operates in a predetermined manner.

In general, unnecessary electromagnetic emission from electric equipment is 15 alleviated by matching circuits, or by providing a shield made of metal or the like. However, in the non-contact communication system described above, the interrogator and the responder form a complete circuit with space interposed in between, and therefore it is difficult to achieve circuit matching. On the other hand, by shielding the whole interrogator, as by forming the housing thereof out of 20 metal or the like, it is possible to alleviate unnecessary electromagnetic emission, but this makes communication impossible. For these reasons, it is customary, as a measure to alleviate unnecessary electromagnetic emission from the interrogator 1, to enclose only the internal circuits 10 thereof, i.e. the electric circuits other than the antenna 14, in metal or the like.

However, in the conventional interrogator, almost no measures are taken against unnecessary electromagnetic emission from its antenna itself, and thus unnecessary electromagnetic emission from the interrogator as a whole is not satisfactorily alleviated.

5

Disclosure of the invention

According to the present invention, in a communication device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis, electric circuits other than an antenna are enclosed in a first shielding member made of a material that shuts off, reflects, or absorbs radio waves, and the antenna is enclosed in a second shielding member of which the portion facing the front face of the antenna is made of a material that attenuates radio waves in a predetermined frequency band.

Alternatively, according to the present invention, in a communication device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis, an antenna and electric circuits other than the antenna are separately enclosed in shielding members made of a material that shuts off, reflects, or absorbs radio waves, and the shielding members have an opening formed in the portion thereof facing the front face of the antenna.

Brief description of drawings

Figs. 1A and 1B are an external front view and a sectional view, respectively, of the interrogator of a first embodiment of the invention.

Fig. 2 is a diagram showing an example of the frequency response of the shielding member used in the interrogator of the first embodiment of the invention.

Fig. 3 is a diagram showing another example of the frequency response of the shielding member used in the interrogator of the first embodiment of the
5 invention.

Figs. 4A, 4B, and 4C are an external front view and sectional views, respectively, of the interrogator of a second embodiment of the invention.

Fig. 5 is a diagram showing the frequency response of the radio waves emitted from the antenna of the interrogator to outside the interrogator in the
10 second embodiment of the invention.

Figs. 6A and 6B are diagrams showing the results of the measurement of unnecessary electromagnetic emission from a conventional interrogator and from the interrogator of the second embodiment of the invention, respectively.

Fig. 7 is a block diagram showing a system consisting of an interrogator and
15 a responder.

Fig. 8 is a diagram showing the waveforms of the signals communicated between the interrogator and the responder.

Best mode for carrying out the invention

20 Hereinafter, embodiments of the present invention will be described with reference to the drawings. The interrogator 1 of a first embodiment of the invention has the same configuration as that shown in Fig. 7. Fig. 1A is an external front view of this interrogator 1, and Fig. 1B is a sectional view thereof taken along line A-A' shown in Fig. 1A. The internal circuits 10 other than the

antenna 14 are enclosed in a shielding member 100 made of a material that shuts off, reflects, or absorbs (in other words, attenuates) radio waves. The shielding member is made of, for example, metal.

The shielding member 100 enclosing the internal circuits 10 has a recess I
5 formed therein so as to sink inward. The antenna 14 is arranged in this recess I. In front of the antenna 14, a shielding member 200 made of a material that attenuates radio waves in a predetermined frequency band is arranged so as to cover the opening of the recess I. Thus, the antenna 14 is enclosed, at the front face thereof, by the shielding member 200 and, at the other faces than the front face
10 thereof, by the shielding member 100, which encloses the internal circuits 10 as well.

In this structure, by forming the shielding member 200 out of a material that has such a frequency response as to permit passage of radio waves only in a frequency band centered around the frequency "f" used for communication as
15 shown in Fig. 2, it is possible to alleviate unnecessary electromagnetic emission from the antenna 14 to outside the interrogator while securing satisfactory communication quality.

In a case where the level of unnecessary electromagnetic emission is low in a frequency band lower than the frequency "f" used for communication, the shielding
20 member 200 may be formed out of a material that has such a frequency response as to attenuate radio waves in a frequency band higher than the frequency "f" used for communication as shown in Fig. 3.

Moreover, as shown in Fig. 1B, by inserting a filter F_1 having a frequency response identical with that of the shielding member 200 in the line L that

electrically connects the antenna 14 to the internal circuits 10, it is possible to further alleviate unnecessary electromagnetic emission.

The interrogator 1 of a second embodiment of the invention has the same configuration as that shown in Fig. 7. Fig. 4A is an external front view of this 5 interrogator 1, Fig. 4B is a sectional view thereof taken along line A-A' shown in Fig. 4A, and Fig. 4C is a sectional view thereof taken along line B-B' shown in Fig. 4A. The internal circuits 10 other than the antenna 14 are enclosed in a shielding member 300 made of a material that shuts off, reflects, or absorbs radio waves.

The shielding member 300 enclosing the internal circuits 10 has a recess I 10 formed therein so as to sink inward. The antenna 14 is arranged in this recess I. In front of the antenna 14, a shielding member 400 made of a material that shuts off, reflects, or absorbs radio waves is arranged so as to cover the opening of the recess I. The shielding member 400 has four quadrilateral openings W formed in a grid-like formation in the portion thereof facing part of the front face of the antenna 14. 15 Thus, when the interrogator 1 is viewed from its front face, part of the front face of the antenna 14 can be seen through the four openings W. In this way, the shielding member enclosing the antenna 14 has openings formed in the portion thereof facing part of the front face of the antenna 14. The shielding members 300 and 400 may be formed integrally out of, for example, the same metal.

20 In this structure, the attenuation of the radio waves emitted from the antenna 14 to outside the interrogator and their frequency have a relationship as shown in Fig. 5. That is, radio waves are attenuated in a frequency band below and including a cut-off frequency " f_c ". This cut-off frequency " f_c " correlates with the openings W of the shielding member 400 (specifically, the larger the area of the

part of the antenna 14 that can be seen through the openings W, the lower the cut-off frequency “ f_c ”). Therefore, by forming the openings W in the shielding member 400 appropriately so that the cut-off frequency “ f_c ” equals to the upper limit of the frequency band in which radio waves need to be attenuated, it is
5 possible to alleviate unnecessary electromagnetic emission from the antenna 14.

Fig. 6A shows the results of the measurement of unnecessary electromagnetic emission (from 30 [MHz] to 1 [GHz]) emitted from a conventional interrogator, and Fig. 6B shows the results of the same measurement conducted with the interrogator of the second embodiment. These figures show that
10 unnecessary electromagnetic emission is greatly reduced with the interrogator of the second embodiment than with the conventional one.

In a non-contact communication system, the frequency used for communication is, for example, 13 [MHz]. Thus, in the structure of the second embodiment, which exhibits a frequency response as shown in Fig. 5, attempting to
15 attenuate interfering radio waves defined as such in the relevant standards (from 30 [MHz] to 1 [GHz]) results in attenuating the radio waves used for communication as well. However, even then, magnetic coupling between the interrogator and the responder is secured, and therefore communication is unlikely to be affected in any way. This is because, as described earlier, in a non-contact communication
20 system, communication is achieved by electromagnetic induction, and therefore communication is possible as long as magnetic coupling is secured between the interrogator and the responder.

As shown in Fig. 4B, by inserting a filter F_2 having a frequency response determined by the openings W of the shielding member 400 in the line L that

electrically connects the antenna 14 to the internal circuits 10, it is possible to further alleviate unnecessary electromagnetic emission.

The openings formed in the shielding member 400 may have any other shape than a quadrilateral shape; for example, they may be circular in shape.

- 5 There may be formed more or less than four such openings.

In the embodiments described above, the internal circuits may be enclosed doubly in a radio wave reflecting member made of, for example, metal and a radio wave absorbing member made of, for example, ferrite, with the radio wave reflecting member arranged outside and the radio wave absorbing member inside.

- 10 This helps further alleviate unnecessary electromagnetic emission from the internal circuits.

Industrial applicability

As described above, according to the present invention, in a communication

- 15 device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis, it is possible to alleviate unnecessary electromagnetic emission from an antenna. This is useful in a non-contact communication system.

CLAIMS

1. A communication device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis,

5 wherein electric circuits other than an antenna are enclosed in a first shielding member made of a material that shuts off, reflects, or absorbs radio waves, and the antenna is enclosed in a second shielding member of which a portion facing a front face of the antenna is made of a material that attenuates radio waves in a predetermined frequency band.

10

2. A communication device as claimed in claim 1, wherein a filter is inserted in a line that electrically connects the antenna to other electric circuits.

15 3. A communication device as claimed in claim 2, wherein the filter has a frequency response identical with a frequency response of the portion of the second shielding member facing the front face of the antenna.

20 4. A communication device as claimed in claim 1, wherein a portion of the first shielding member is shared as a portion of the second shielding member other than the portion thereof facing the front face of the antenna.

5. A communication device as claimed in claim 4, wherein the first shielding member has a recess formed therein so as to sink inward, the antenna is arranged in the recess, and the second shielding member is arranged so as to cover

- 11 -

an opening of the recess.

6. A communication device as claimed in claim 1, wherein the portion of the second shielding member facing the front face of the antenna has such a frequency response as to permit passage of radio waves only in a frequency band centered around a frequency used for communication.

7. A communication device as claimed in claim 1, wherein the first shielding member has a double structure by being composed of an inner layer made of a material that absorbs radio waves and an outer layer made of a material that reflects radio waves.

8. (Amended) A communication device that supplies electric power to a communication partner and communicates therewith by electromagnetic induction on a non-contact basis,

wherein electric circuits other than an antenna are enclosed in a first shielding member made of a material that shuts off, reflects, or absorbs radio waves, and the antenna is enclosed in a second shielding member that has an opening formed in a portion thereof facing a front face of the antenna so as to attenuate radio waves in a frequency band corresponding to an area of the opening.

9. A communication device as claimed in claim 8, wherein a filter is inserted in a line that electrically connects the antenna to other electric circuits.

25 10. A communication device as claimed in claim 9, wherein the filter has

a frequency response identical with a frequency response of the portion of the second shielding member facing the front face of the antenna.

11. A communication device as claimed in claim 8, wherein a portion of
5 the first shielding member is shared as a portion of the second shielding member
other than the portion thereof facing the front face of the antenna.

12. A communication device as claimed in claim 11, wherein the first
shielding member has a recess formed therein so as to sink inward, the antenna is
10 arranged in the recess, and the second shielding member is arranged so as to cover
an opening of the recess.

13. A communication device as claimed in claim 8, wherein the opening
formed in the second shielding member is formed in such a way that the portion of
15 the second shielding member facing the front face of the antenna has such a
frequency response as to attenuate radio waves in a frequency band below and
including an upper limit of frequencies that need to be attenuated.

14. A communication device as claimed in claim 13, wherein the second
20 shielding member has four quadrilateral openings formed therein in a grid-like
arrangement.

15. A communication device as claimed in claim 8, wherein the first
shielding member has a double structure by being composed of an inner layer

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made of a material that absorbs radio waves and an outer layer made of a material that reflects radio waves.

2025 RELEASE UNDER E.O. 14176

ABSTRACT

In a communication device, electric circuits other than an antenna are enclosed in a shielding member made of a material that shuts off radio waves, and the antenna is enclosed by disposing in front thereof a radio wave absorbing member that attenuates radio waves in a predetermined frequency band. Thus, unnecessary electromagnetic emission is alleviated while satisfactory communication quality is secured.

2025 RELEASE UNDER E.O. 14176

FIG.1A

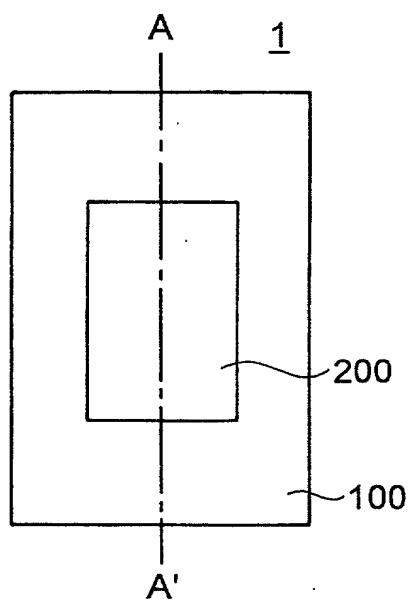
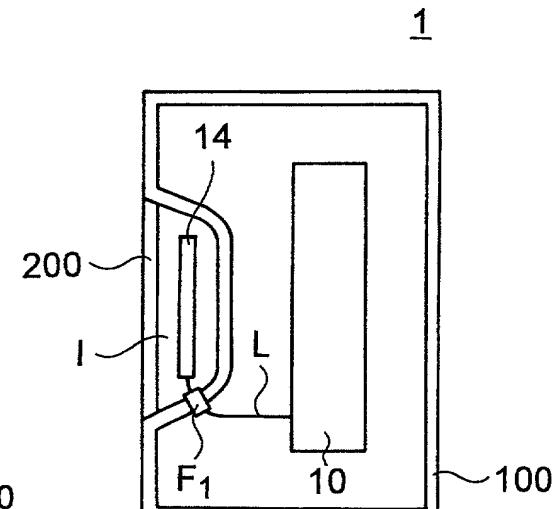
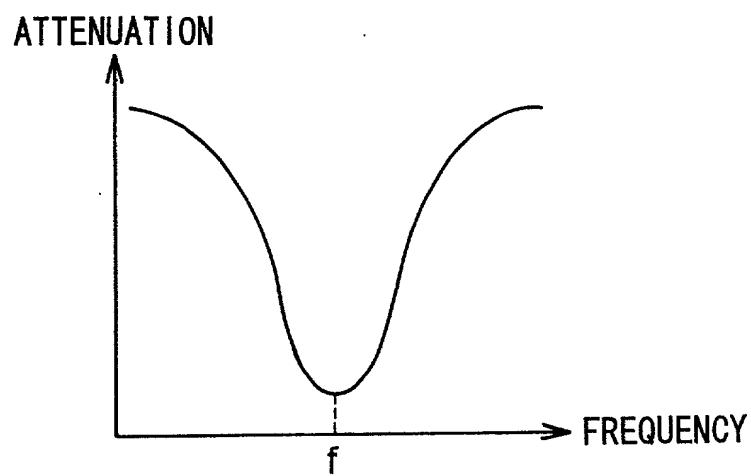
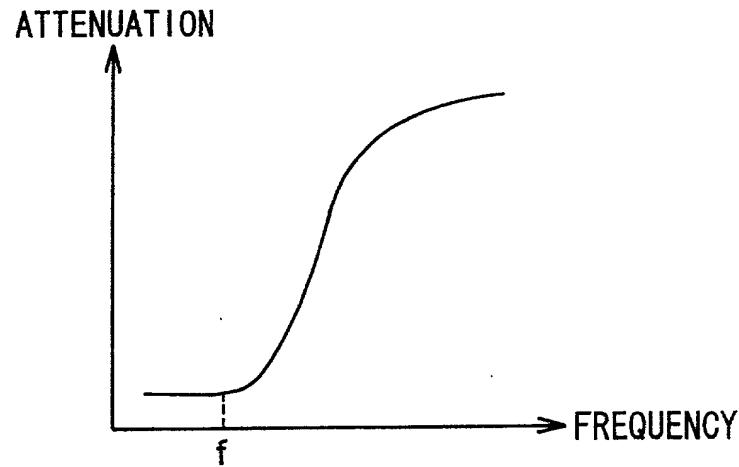


FIG.1B

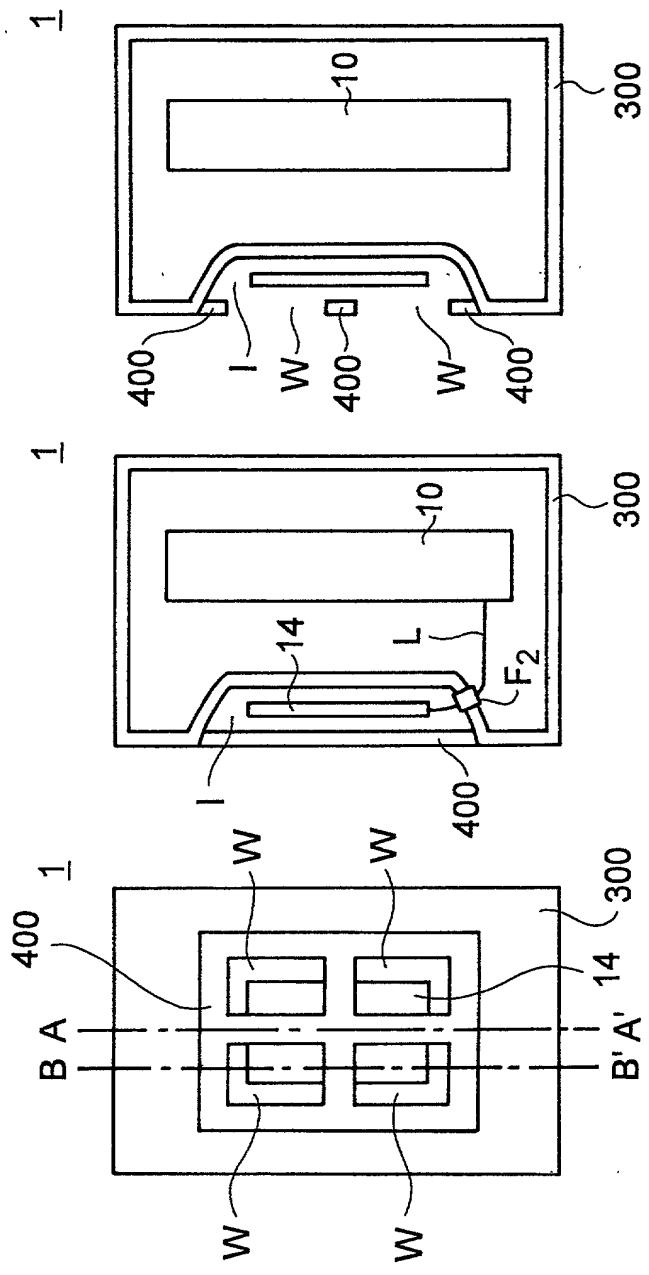


2/7

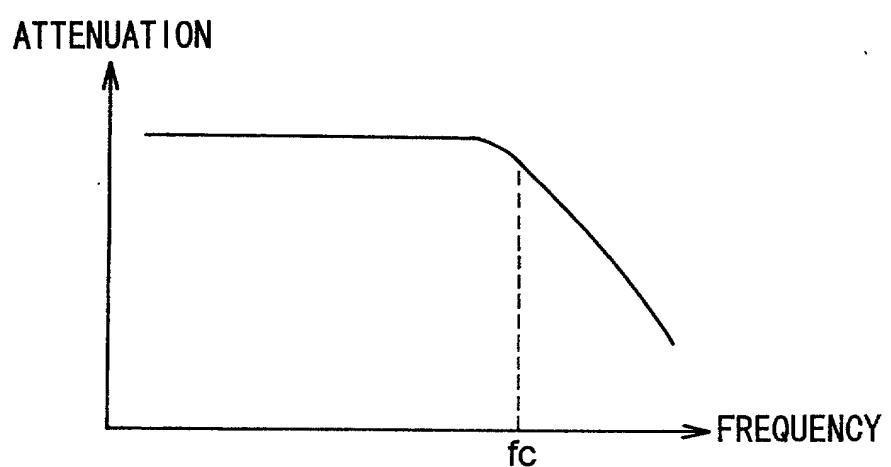
FIG.2**FIG.3**

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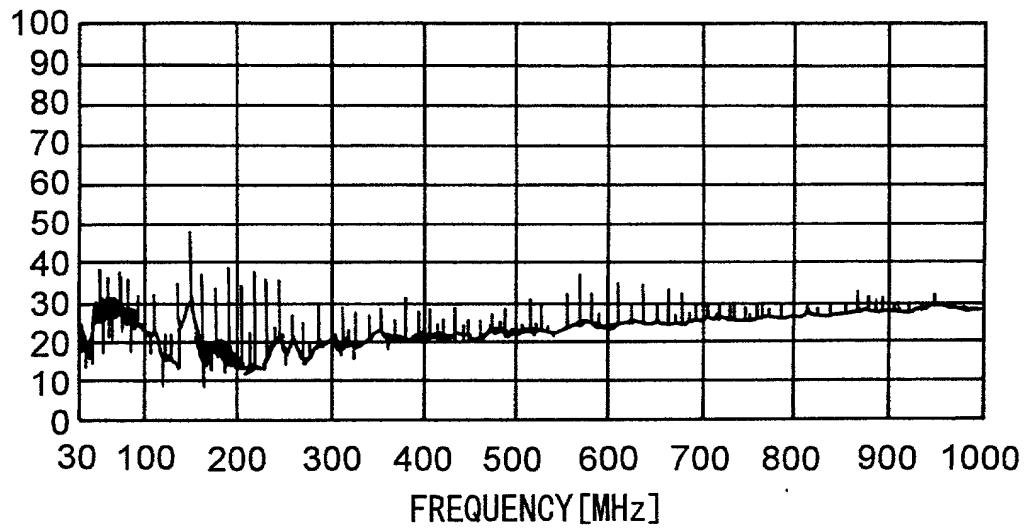
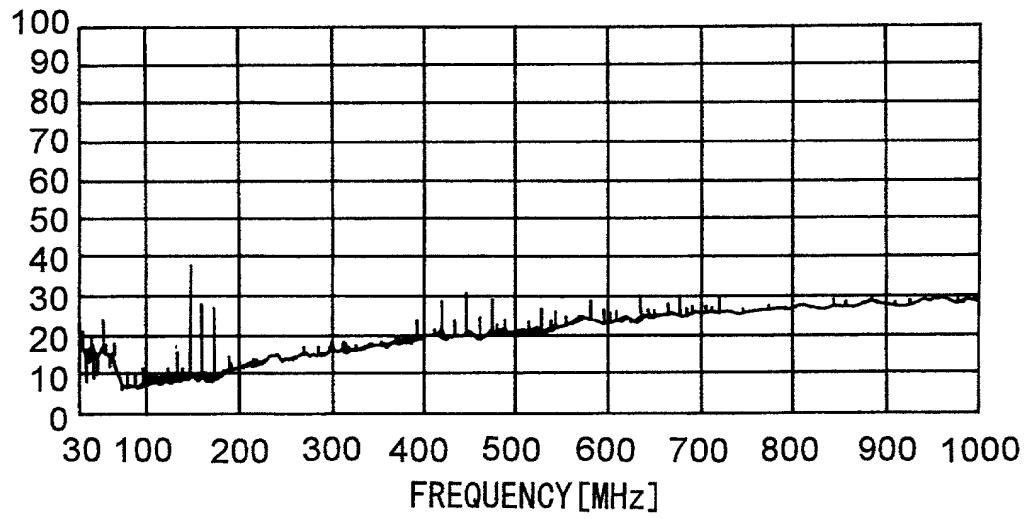
FIG.4A FIG.4B FIG.4C



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FIG.5

5/7

FIG.6A**FIG.6B**

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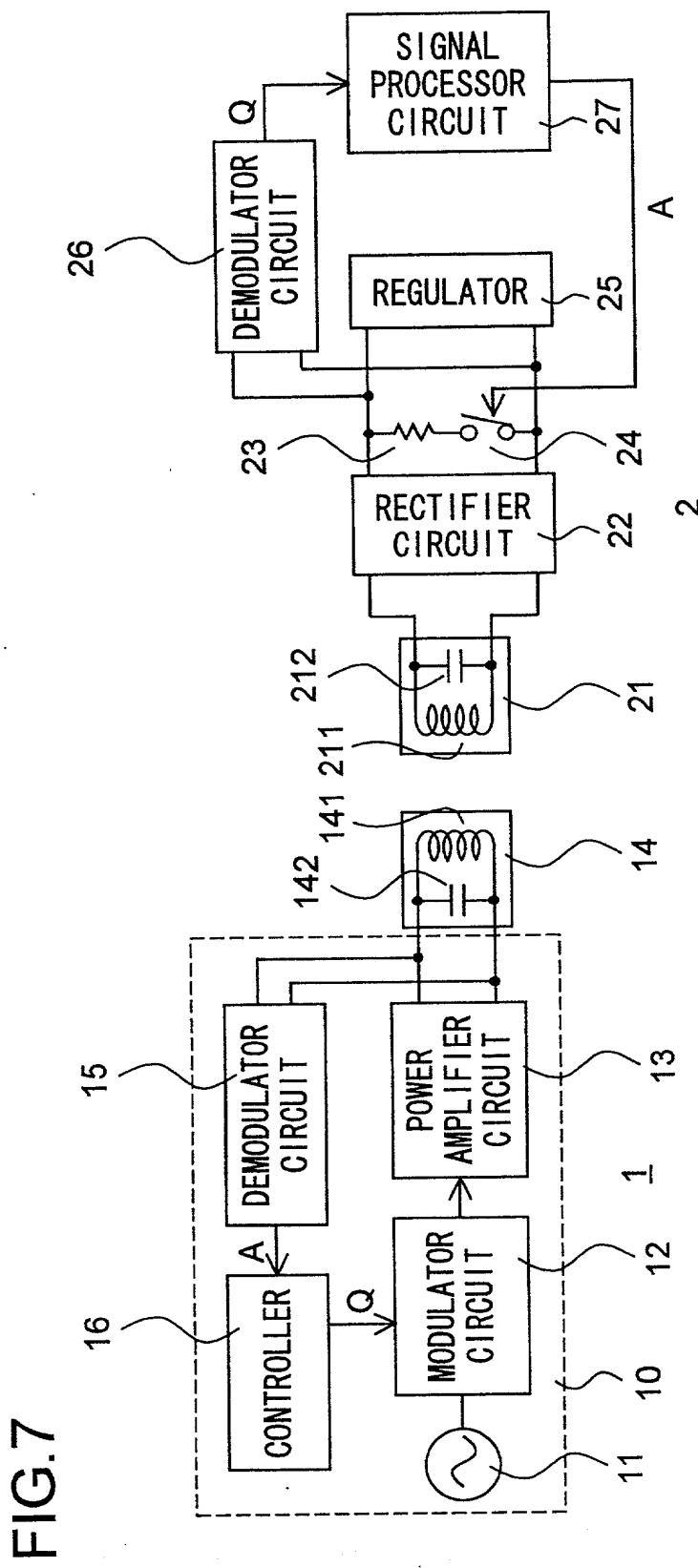
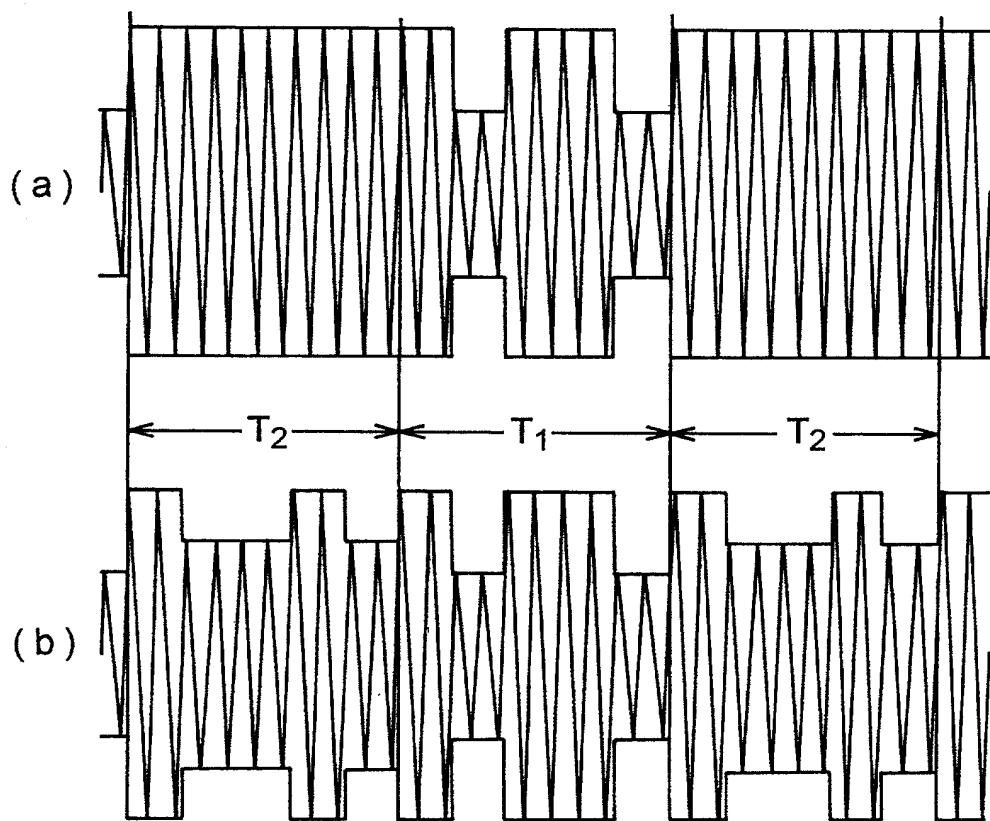


FIG.8



Docket No. _____

RADER FISHMAN GRAUER, PLLC

Declaration For U.S. Patent Application

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled
(Insert Title) COMMUNICATION DEVICE

the specification of which is attached hereto unless the following box is checked:

was filed on September 8, 2000 As PCT International Application
Number PCT/JP00/06178 and was amended on July 18, 2001
and/or was filed on _____ As U.S. Patent Application
Number _____ and was amended on _____

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §119 (a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365 (a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate or PCT International Application having a filing date before that of the application(s) for which priority is claimed:

| (List Prior foreign applications) | <u>H11-290420</u> | <u>JAPAN</u> | <u>13 October, 1999</u> | Priority Claimed |
|-----------------------------------|-------------------|------------------|-------------------------------|---|
| | (Number) | (Country) | (Day/Month/Year Filed) | <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No |
| | <u>(Number)</u> | <u>(Country)</u> | <u>(Day/Month/Year Filed)</u> | <input type="checkbox"/> Yes <input type="checkbox"/> No |
| | <u>(Number)</u> | <u>(Country)</u> | <u>(Day/Month/Year Filed)</u> | <input type="checkbox"/> Yes <input type="checkbox"/> No |

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

| (Application Number) | (Filing Date) |
|-----------------------------|----------------------|
| <u>(Application Number)</u> | <u>(Filing Date)</u> |

See attached list for additional prior foreign or provisional applications.

I hereby claim the benefit under 35 U.S.C. §120 of any United States application(s) or §365(c) of any PCT International application(s) designating the United States of America listed below, insofar as the subject matter of each of the claims of this application is not disclosed in the prior application(s) (U.S. or PCT) in the manner provided by the first paragraph of 35, U.S.C. §112, I acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. §1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application.

| (List prior U.S. Applications or PCT International applications designating the U.S.) | (Application Serial No.) | (Filing Date) | (Status) (patented, pending, abandoned) |
|---|---------------------------------|----------------------|--|
| | <u>(Application Serial No.)</u> | <u>(Filing Date)</u> | <u>(Status) (patented, pending, abandoned)</u> |

And I hereby appoint the firm of Rader, Fishman & Grauer, PLLC, Customer Number 23353 including as principal attorneys: Richard D. Grauer, Reg. No. 22,388; David T. Nikaido, Reg. No. 22,663; Ronald P. Kananen, Reg. No. 24,104; H. Lawrence Smith, Reg. No. 24,900; Ralph T. Rader, Reg. No. 28,772; Carl Schaukowitch, Reg. No. 29,211; Michael D. Fishman, Reg. No. 31,951; Joseph V. Coppola, Sr., Reg. No. 33,373; Michael B. Stewart, Reg. No. 36,018; Alexander D. Rabinovich, Reg. No. 37,425; Kevin D. Rutherford, Reg. No. 40,412; Glenn E. Forbis, Reg. No. 40,610; Kristin L. Murphy, Reg. No. 41,212; Matthew J. Russo, Reg. No. 41,282; Robert S. Green, Reg. No. 41,800; David K. Benson, Reg. No. 42,314; Brian K. Dutton, Reg. No. 47,255; Eugene G. Byrd, Reg. No. 47,361

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The undersigned hereby authorizes the U.S. attorneys named herein to accept and follow instructions from the undersigned's assignee, if any, and/or, if the undersigned is not a resident of the United States, the undersigned's domestic attorney, patent attorney or patent agent, as to any action to be taken in the Patent and Trademark Office regarding this application without direct communication between the U.S. attorneys and the undersigned. In the event of a change in the persons) from whom instructions may be taken, the U.S. attorneys named herein will be so notified by the undersigned

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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Inventor's signature

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